

WHAT IS CLAIMED IS:

1. A keeper-shield assembly for housing a magnet, said keeper-shield assembly comprising:

a keeper-shield having a central axis and comprising a material substantially permeable to a magnet flux;

a first cavity in said keeper-shield, said cavity comprising an inner side wall and a base, and said cavity being adapted to accept a core;

a core located within said cavity and lining at least part of said inner side wall of said cavity, said core having a second cavity adapted to retractably receive a magnet;

a magnet comprising a front and a rear face, said magnet slidably mounted in said second cavity;

a lip at an open end of said keeper-shield, said lip extending from an inner side wall of said keeper-shield toward said central axis of said keeper-shield;

one or more resilient members configured to contribute a force against said magnet; and

a movable actuator extending through said base and configured to contribute a force against said magnet, wherein said movable actuator and said one or more resilient members cooperate to move a portion of said magnet from said retracted position to a position outside of said inner cavity; and wherein said keeper-shield is sufficiently thick so that a magnetic flux density is less than about 100 gauss at a distance of about 2 centimeters from said keeper-shield when said magnet is in a retracted position.

2. The keeper-shield assembly of Claim 1, wherein said magnet comprises material selected from the group consisting of rare earth elements, ceramics, ceramic oxides, ferrites, and garnets.

3. The magnet keeper-shield assembly of Claim 2, wherein said magnet comprises material selected from the group consisting of NdFeB, AlNiCo, and SmCo.

4. The keeper-shield assembly of Claim 3, wherein said magnet comprises NdFeB.

5. The keeper-shield assembly of Claim 1, wherein said keeper-shield assembly further comprises a spacer of comprising a non-magnetic material at said rear face of said magnet and said movable actuator contacts said spacer.

6. The keeper-shield assembly of Claim 1, wherein said lip comprises a magnetically permeable material.

7. The keeper-shield assembly of Claim 1, wherein said keeper-shield is configured so that that said magnetic flux density that emanates from said keeper-shield is reduced by at least 10-fold when said magnet is moved from an extended position, wherein said magnet extends out of said second cavity to a retracted position so that said magnet is substantially within said second cavity.

8. The keeper-shield assembly of Claim 5, wherein said keeper-shield is configured so that that said magnetic flux density that emanates from said keeper-shield is reduced by at least 50-fold when said magnet is moved from an extended position, wherein said magnet extends out of said second cavity to a retracted position so that said magnet is substantially within said second cavity.

9. The keeper-shield assembly of Claim 1, wherein said one or more resilient members comprises springs of varying lengths.

10. The keeper-shield assembly of Claim 9, wherein at least one of said springs is coaxial with said movable actuator and is in contact with said rear face of said magnet and said base of said keeper-shield.

11. The keeper-shield assembly of Claim 1, wherein said one or more resilient members are springs which extend through said base of said keeper-shield and are in contact with said rear face of said magnet.

12. The keeper-shield assembly of Claim 11, further comprising a guide pin coaxially mounted within one or more of each of said one or more springs.

13. The keeper-shield assembly of Claim 1, wherein said keeper-shield assembly further comprises a spacer comprising a non-magnetic material and said movable actuator contacts said spacer.

14. The keeper-shield assembly of Claim 1, further comprising a housing encasing said keeper-shield, said core, said magnet, said one or more resilient members and said movable actuator, wherein said housing comprises a slot through which a lever moves.

15. The keeper-shield assembly of Claim 14, further comprising a lever extending through said slot in said housing and configured to exert a force against said movable actuator.

16. The keeper-shield assembly of Claim 15, wherein said lever is moveable in two directions such that when said lever is moved in a first direction said magnet is progressively moved out of said second cavity and when said lever is moved in a second direction said magnet is progressively moved in to said second cavity.

17. The keeper-shield assembly of Claim 15, wherein said lever is configured to move said magnet from an extended position wherein a portion of said magnet extends from said first cavity and a retracted position wherein said magnet is within said first cavity.

18. The keeper-shield assembly of Claim 14, wherein said lever is moveable by human hands without the aid of additional tools.

19. The keeper-shield assembly of Claim 18, wherein a force applied to said lever by human hands to move said lever is less than about 40 pounds.

20. The keeper-shield assembly of Claim 18, wherein a force applied to said lever by human hands to move said lever is less than about 20 pounds.

21. The keeper-shield assembly of Claim 18 wherein a force applied to said lever by human hands to move said lever is less than about 10 pounds.

22. The keeper-shield assembly of Claim 14, further comprising:

- an actuator rod with a first and second end, wherein with said first end is in contact with said magnet;

- a rod located substantially perpendicular to said central axis and coupled to said second end of said actuator rod;

- a cylinder located within said housing and having a spiral slot winding around a portion of said central axis, said spiral slot being configured to slidingly engage said rod, and

- a lever coupled to said cylinder and configured to translate said actuator rod through said slot in response to rotation of said lever around a portion of said axis.

23. The keeper-shield assembly of Claim 22, wherein rotating said lever results in a force being applied to said rod parallel to said central axis.

24. The keeper-shield assembly of Claim 22, wherein said cylinder is coaxial with said central axis.

25. The keeper-shield assembly of Claim 22, wherein said keeper-shield assembly further comprises a non-magnetic spacer that is in contact with said first end of said actuator rod.

26. The keeper-shield assembly of Claim 22, wherein said translation of said rod extends or retracts said magnet relative to said keeper-shield.

27. A keeper-shield assembly comprising:
a central axis;

a plurality of keeper-shields each comprising a material substantially permeable to a magnet flux;

a first cavity in each of said keeper-shields, said first cavity in each of said keeper-shields comprising an inner side wall and a base, and said first cavity in each of said keeper-shields being adapted to accept a core that lines part or all of said inner side wall of said first cavity in each of said keeper-shields; each of said cores having a second cavity adapted to accept either a keeper-shield or a magnet;

a magnet comprising a front and a rear face, wherein said magnet is slidably mounted in an innermost one of said second cavities;

at least one resilient member configured to contribute a force against said rear face of said magnet;

an actuator extending through said base and configured to contribute a force against said rear face of said magnet, wherein a force from said actuator combined with a force from said resilient members moves said magnet from said retracted position to a position wherein a portion of said magnet extends outside of each of said second cavities; and wherein said keeper-shield is sufficiently thick so that a magnetic flux density is less than about 100 gauss at a distance of about 2 centimeters from said keeper-shield assembly when said magnet is in a retracted position.

28. The keeper-shield assembly of Claim 27, further comprising a lip at an open end of said keeper-shields, said lip extending from an inner side wall of said keeper-shield toward said central axis of said keeper-shield assembly.

29. The keeper-shield assembly of Claim 27, wherein one or more of said keeper-shields comprises a lip at an open end of said plurality of keeper-shields, said lip extending from said inner side wall of at least one of said plurality of keeper-shields toward said central axis of said keeper-shield assembly, and wherein said lip comprises a material such that said magnetic field emanating from said magnet is attenuated by said lip

30. The keeper-shield assembly of Claim 27, wherein said lip is composed of a magnetically permeable material.

31. The keeper-shield assembly of Claim 27, wherein one or more of said plurality of keeper-shields is configured so that that said magnetic flux density emanated from said keeper-shield assembly is reduced by at least 10-fold when said magnet is moved from an extended position wherein said magnet extends out of said second cavity to a retracted position wherein said magnet is substantially within said second cavity.

32. The keeper-shield assembly of Claim 27, wherein one or more of said keeper-shields are configured so that that said magnetic flux density emanated from said keeper-shield is reduced by at least 50-fold when said magnet is moved from an extended position wherein said magnet extends out of said second cavities to a retracted position wherein said magnet is substantially within said second cavities.

33. A method comprising:

administering a composition to a patient, said composition comprising magnetic particles;

extending a magnet from a keeper-shield to produce a substantially unattenuated magnetic field at a distance of about 2 cm from front face of the keeper-shield;

positioning said magnet over a desired location on the patient; and

at some time following said administering, retracting said magnet into the keeper-shield to produce at least about 10 fold attenuation of the magnetic field at a distance of about 2 cm from the north pole of the magnet.

34. The method of Claim 33, wherein extending the magnet comprises moving a lever configured to exert a force against the magnet, wherein the force against the magnet moves the permanent magnet in the keeper-shield, and wherein the lever is configured to move the magnet in two opposite directions.

35. An apparatus comprising:

means for administering a composition to a patient, said composition comprising magnetic particles;

means for extending a magnet from a keeper-shield assembly to produce a substantially unattenuated magnetic field at a distance of about 2 cm from a north pole of the magnet;

means for positioning said magnet over a desired location on the patient; and

means for retracting said magnet into the keeper-shield to produce at least about 10 fold attenuation of the magnetic field at a distance of about 2 cm from the north pole of the magnet.